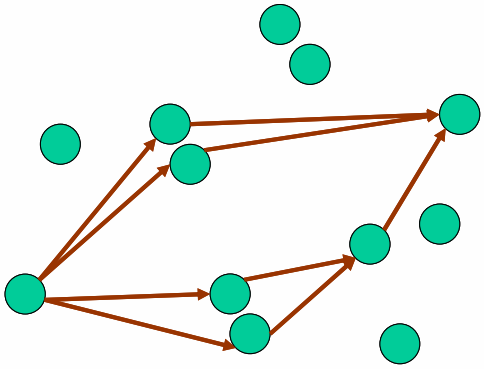
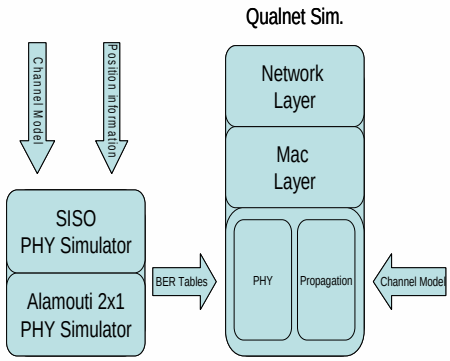
Performance of Cooperative and Non-cooperative Relaying in Wireless Networks

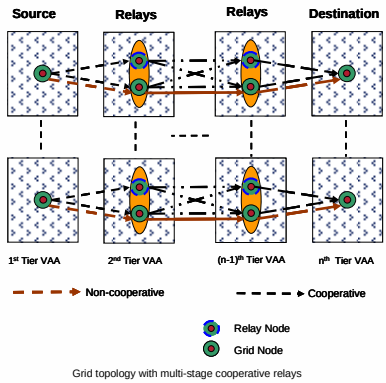
Convergent technology research for digital media processing and communications



Main aim of relaying is to improve coverage and performance of the wireless networks, and has impacts on the amount of traffic carried over the link, interference, power consumption, etc.

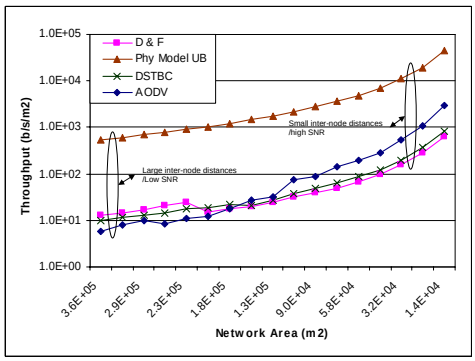


We have used a combined simulation environment to simulate performance of selected relaying algorithms.

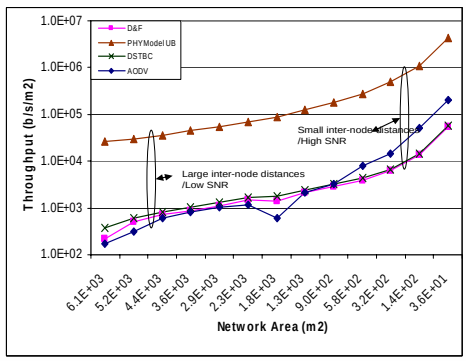


Grid topology with multi-stage cooperative relays

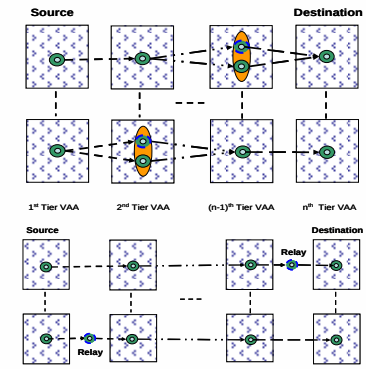
This scenario is used to demonstrate the performance of the D&F and D-STBC relaying compared to the dynamic routing protocol (AODV) for both LOS and NLOS environments for a grid topology network. In this scenario every intermediate node acts as relay, if necessary.



Aggregate network throughput for AWGN (LOS) Channel Model is shown above. Performance of the dynamic routing protocol suffers when SNR is low.

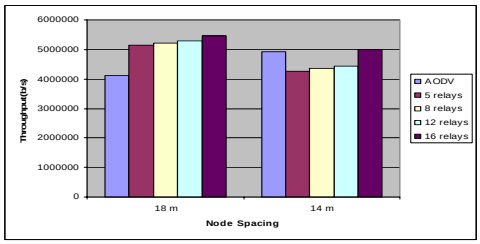


On the other hand, if the propagation environment is NLOS, relaying provides better throughput results compared to routing for low SNR values

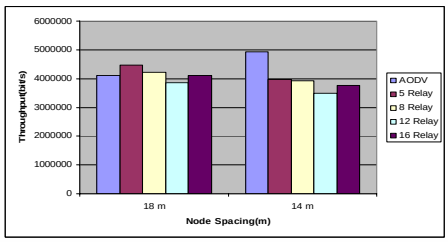


Grid topology with randomly placed cooperative and non-cooperative relays

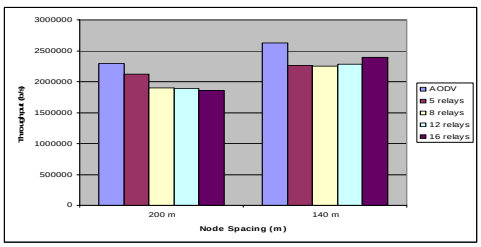
In this scenario, The maximum achievable throughput is investigated for randomly placed relaying nodes in a grid topology. The relay positions are assumed to be ideal in order to get maximum achievable throughput results.



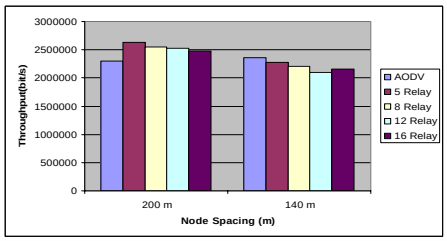
Randomly placed cooperative relays for Channel A



Randomly placed non-cooperative relays for Channel A



Randomly placed cooperative relays for AWGN channel



Randomly placed non-cooperative relays for AWGN channel

Conclusions

- Using relays at low densities can improve the overall network throughput significantly depending on network scenario and propagation environment.
- The use of ST cooperation in free space (no multi-path) propagation environments degrades the N-SAP throughput, due to the poor BER performance of space time block codes in LOS propagation environment.
- In NLOS propagation scenarios, use of relays can improve the network throughput for both cooperative and non-cooperative scenarios (the improvement is more significant for cooperative scenarios).
- The overall throughput of the network decreases with the increasing number of randomly placed relaying nodes for non-cooperative scenarios, reflecting the increased interference caused by the extra relaying nodes deployed in the network.
- Assigning and managing relays for wireless networks using dynamic routing protocols remains as a big challenge that needs to be tackled.

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